

REMARKS

Status of Claims:

Claims 1-30 were pending in the application; claim 31 is hereby added by amendment. Claims 1-31 are now pending. Each of the pending claims defines an invention that is novel and unobvious over the cited art. Favorable consideration of this case is respectfully requested.

Disclosure Supporting the Instant Amendment:

In the specification.

Page 6, the paragraph spanning lines 10-14 is amended to recite the equivalence of the terms “PR” and “photoresist.” This recitation is not new matter in view of the recitation of these terms in claims 1, 5, 9-11, and 17.

Page 8, the paragraph spanning lines 3-6 is amended to recite epoxies and diamond-like carbon. Said recitation was originally present in claim 19.

Page 8, the paragraph spanning lines 3-6 is amended to recite “the underlayer comprises the elements C, H, and O.” Said recitation was originally present in claim 17.

Page 8, the paragraph spanning lines 3-6 is amended to recite the composition of the polymers as a Markush group. Said recitation was originally present in claim 11.

Page 8, the paragraph spanning lines 12-25 is amended to recite the radiation is substantially monochromatic. Said recitation was originally present in claims 14 and 15.

Page 9, the paragraph spanning lines 6-10 is amended to recite the composition of the plasma as a Markush group. Said recitation was originally present in claim 21.

In the claims.

Claim 1 is hereby amended to cancel certain recitations and to substitute the term “photoresist” for the term “PR.” Support for this recitation was present in original claims 1, 5, 9-11, and 17.

Dependent claims 2-26 and 29-30 are amended to recite “The method.”

Claim 6 is amended to recite “neutrals and ions.” This recitation was originally present in claim 21.

Claims 14 and 15 are amended to depend from claim 12 to provide antecedent basis for the recitation “ultraviolet light.”

Independent claim 27 is amended to recite “A reduced ...resist image.”

New claim 31 is added by amendment to present recitations originally presented in claim 1.

Rejections Under 35 U.S.C. § 112, 1st Paragraph:

Claims 6, 7, 11, 14, 15, 17-19, and 21 were rejected under 35 U.S.C. § 112, 1st Paragraph, as containing subject matter which was not described in the specifications in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention.

Claims 6 and 18 were rejected for reciting “hydrogen, fluorine, and chlorine.” The specification, the paragraph at page 9, lines 6-10 is amended to provide the required recitation. The amendment does not comprise new matter because original claims are part of the original specification.

Claim 7 was rejected for reciting “a tuned polymer comprising carbon, hydrogen, and oxygen.” Claim 19 was rejected for reciting the “tuned polymer” comprises a polymer selected from “epoxies and diamond-like carbon.” The specification, the paragraph at page 8, originally lines 3-6 is amended to provide the required recitation. The amendment does not comprise new matter because original claims are part of the original specification.

Claim 11 was rejected for reciting various monomers. The specification, the paragraph at page 8, originally lines 3-6 is amended to provide the required recitation. The amendment does not comprise new matter because original claims are part of the original specification.

Claims 14 and 15 were rejected for reciting monochromatic radiation. The specification, the paragraph at page 8, originally lines 12-25 is amended to provide the

required recitation. The amendment does not comprise new matter because original claims are part of the original specification.

Claim 17 was rejected for reciting the term “stable.” The original specification at page 7, lines 24-25 disclosed that the “optical properties of tuned polymer 6 should be relatively stable under a variety of processing conditions.”

Claim 21 was rejected for reciting “neutrals and ions.” The specification, the paragraph at page 9, originally lines 6-10 is amended to provide the required recitation. The amendment does not comprise new matter because original claims are part of the original specification.

Rejections Under 35 U.S.C. § 112, 2nd Paragraph:

Claims 1-2 7 and 30 were rejected under 35 U.S.C. § 112, 2nd Paragraph, as being indefinite.

Claim 1 was rejected for providing a layer on an “optional” hardmask. Claim 1 is amended to cancel reference to the hardmask. Claim 31 is added by amendment to present the recitations relating to providing an underlayer on the hardmask.

Claims 3, 7, and 19 were deemed indefinite for reciting a “tuned polymer.” The characteristics and properties defining and required of a tuned polymer were disclosed at page 7, line 17 through page 8, line 11.

Claims 14 and 15 were rejected for reciting “ultraviolet radiation.” Claims 14 and 15 are amended to depend from claim 12 which provides proper antecedent basis for the recitation “ultraviolet.”

Claim 19 was rejected for reciting “said tuned polymer.” Claim 1 is amended to recite “tuned polymer” in order to provide proper antecedent basis.

Claim 26 was rejected for reciting “said process parameters.” Claim 26 is amended to depend from claim 25 which provides proper antecedent basis.

Claim 27 was rejected for reciting “The reduced....” Claim 27, an independent claim is amended to recite “A reduced...”

Claim 30 was rejected for reciting “The semiconductor....” Claim 30, an independent claim is amended to recite “A semiconductor...”

Rejection Under 35 U.S.C. § 103(a):

Claims 1, 2, 4-6, 8, 12, 13, 17, 18, 20, and 22-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pike (6,420,097) in view of allegedly admitted prior art.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*. All words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*. (MPEP § 2143.03). When evaluating the scope of a claim, every limitation in the claim must be considered. See e.g. *In re Ochiai*. (MPEP § 2144.08). The evidentiary record fails to teach each limitation of the present invention. Specifically, the references taken as a whole or severally fail to teach a bilayer resist having an underlayer free of any element that forms a non-volatile oxide.

Claim 1 recites an underlayer free of any element that forms a non-volatile oxide. The specification at page 4, lines 4-5 recites a non-limiting list of elements that are to be avoided because they form non-volatile oxides. Such elements include silicon. Claims 1 and 31 distinguish an underlayer from a hardmask. In the present invention, an underlayer is provided on a substrate (claim 1) or, an underlayer is provided over a hardmask (claim 31). In either case, the bilayer resist is completed by a providing a photoresist layer over the under layer (claim 1).

Pike is silent as to a bilayer resist. Pike provides a resist layer on a hardmask which may comprise a BARC. Pike Fig. 4(a) shows a portion 110 of a semiconductor device being fabricated. Portion 110 includes a semiconductor wafer stack or film stack 112 formed of a substrate and a gate conductor layer or device layer 116. A hardmask layer 118 is deposited on the gate conductive layer 116. In Fig. 4(b) an ultra thin resist (UTR) layer 120 is deposited on the hardmask 118. (Column 3, line 61 to column 4, line

2). Moreover, even if one were to consider the hardmask of Pike to be equivalent to the underlayer of the present invention, Pike fails to teach each recitation. The hardmask of Pike may comprise materials such as silicon dioxide or titanium nitride. Silicon and titanium are to be excluded from the underlayer because they form non-volatile oxides (claim 1). As amended, claim 1 recites the underlayer is a tuned polymer. The properties of a tuned polymer include an optimized interaction between the polymer layer and the imaging resist layer. Pike is silent as to an underlayer comprising a tuned polymer.

Conclusion:

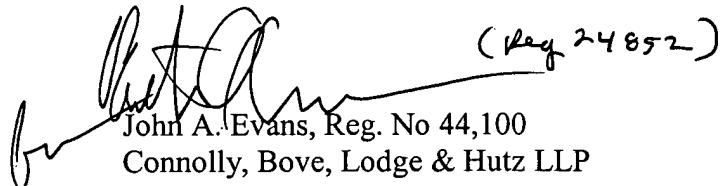
In view of the above, consideration and allowance are, therefore, respectfully solicited.

Accordingly, it is respectfully requested that the foregoing amendments be entered, that the application as so amended receive an examination on the merits, and that the claims as now presented receive an early allowance.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Commissioner is hereby authorized to charge any fees or credit any overpayment associated with this communication, including any extension fees or fees for the net addition of claims, to Deposit Account No. 22-0185.

Respectfully submitted,


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